IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re the Application of: **ONO, Yuji et al.**

Group Art Unit:**1746**

Serial No.: **09/940,788**

Examiner: **Joseph L. Perrin**

Filed: **August 29, 2001**

P.T.O. Confirmation No.: 4613

For: **SINGLE WAFER TYPE SUBSTRATE CLEANING METHOD AND APPARATUS**

SUBMISSION OF APPEAL BRIEF

Commissioner for Patents
P.O. Box 1450
Alexandria, Va 22313-1450

October 7, 2003

Sir:

Submitted herewith are an original and two copies of an Appeal Brief in the above-identified U.S. patent application.

Also enclosed is a check in the amount of **$330.00** to cover the cost of filing this Appeal Brief. In the event that any additional fees are due with respect to this paper, please charge Deposit Account No. 01-2340. This paper is filed in triplicate.

Respectfully submitted,

ARMSTRONG, KRATZ, QUINTOS,
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Enclosures: Duplicate of this paper; Appeal Brief and two copies; and check for **$330.00**

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APPEAL BRIEF FOR THE APPELLANTS

Ex parte ONO et al. (applicant)

Serial Number: **09/940,788**

Filed: **August 29, 2001**

Appeal No. :

Group Art Unit: **1746**

Examiner: **Joseph L. Perrin**

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BRIEF ON APPEAL

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

October 7, 2003

Sir:

I. REAL PARTY IN INTEREST

The real party in interest is S.E.S. Company Limited, as evidenced by the Assignment recorded on August 29, 2001, reel 012127, frame 0032.

II. RELATED APPEALS AND INTERFERENCES

Appellant knows of no other appeal or interference which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

III. STATUS OF CLAIMS

Claims 1-3 are pending in this application. Claims 4-14 have been canceled during prosecution. Claims 1-3 are the subject of this appeal.

IV. STATUS OF AMENDMENTS

No amendment was made subsequent to the final Office action of March 11, 2003.

V. SUMMARY OF THE INVENTION

All three claims are method claims reciting methods for cleaning semiconductor wafers which have been wet-cleaned. The specification explains that wafers which are not stored in a cassette have to be wet-cleaned individually in a sealed cleaning housing and then dried by a spin-drying treatment (page 1, three lines from bottom, to page 2, line 15). The claims recite in particular the spin drying treatment.

Claim 1 recites that the method consists of " the application of a spin drying treatment to the face of each wafer by supporting and rotating each wafer at high speed in the sealed cleaning housing while an inert gas for preventing oxidation is supplied to the face of the wafer in a drying step, where the amount of inert gas to be supplied to the face of each wafer is such that the amount of inert gas supplied at the outer peripheral portion is larger than that at the center thereof." The apparatus itself is not recited in claim 1, but the method can be understood by reference to the apparatus of Figures 1 to 3, which can carry out the recited method.

In particular, Figure 1 illustrates a cleaning housing, and Figure 3 illustrates supporting section 11 and rotary shaft 10, which can support and rotate the wafer at high speed, as recited in claim 1 (see page 9, lines 7-11).

The supplying of inert gas to the face of the wafer is illustrated for this apparatus in Figure 3, in which gas injection section 30 includes supply port 32 with a plurality of injection openings 32a (see page 13, three lines from bottom, to page 14, line 19. The claim recites that "the amount of inert gas to be supplied to the face of each wafer is such that the amount of inert gas supplied at the outer peripheral portion is larger than that at the center thereof", as discussed on page 14, lines 20-22. Exemplary gas flow is illustrated by the arrows in Figures 2 and 3 (see specification on page 17, three lines from bottom).

The specific structure used to achieve the result of supplying of more gas at the outer peripheral portion is **not** recited in the claims. In the exemplary apparatus illustrated in Figure 3, this result is achieved in part by the shape (in particular, the areas) of the injection openings 32a. The effect of the shapes of the injection openings on this result is discussed on page 15, last paragraph, through page 17, second paragraph, of the specification.

The result of supplying inert gas to the face of each wafer such that the amount of inert gas supplied at the outer peripheral portion is larger than that at the center thereof, is that the concentration of oxygen is substantially reduced to zero or close to zero while decreasing the usage of the inert gas as much as possible (page 15, lines 15-22). An exemplary view of the distribution of oxygen in the circum-ambient atmosphere on the face of the wafer is shown in Fig. 5

Claim 2 further limits claim 1 by reciting that a sealed drying space is formed at the outer peripheral portion of the face of the wafer. In the exemplary apparatus of Fig. 3, the gas injection

section 30 cooperates with cleaning chamber 3 so as to form the sealed drying space A (page 20, last full paragraph). The inert gas is supplied to the inside of the sealed drying space.

Claim 3 recites that the inert gas is a nitrogen gas.

VI. ISSUES

Issue A: Whether claims 1-3 are anticipated under 35 U.S.C. 102(b) by Bergman et al. (U.S. Patent No. 5,377,708), as stated in paragraph no. 3 of the final Office action.

Issue B: Whether claims 1-3 are anticipated under 35 U.S.C. 102(b) by Cady (U.S. Patent No. 4,544,445), as stated in paragraph no. 4 of the final Office action.

VII. GROUPING OF THE CLAIMS

For purposes of appeal, the claims are grouped as follows:

Group I: Claims 1 and 3

Group II: Claim 2

VIII. ARGUMENTS

Issue A: Whether claims 1-3 are anticipated under 35 U.S.C. 102(b) by Bergman et al. (U.S. Patent No. 5,377,708), as stated in paragraph no. 3 of the final Office action.

With regard to claim group I (claims 1 and 3), Appellants have previously argued (Amendment of February 10, 2003) that the Examiner did not clearly indicate where Bergman et al. taught the limitation of " where the amount of inert gas to be supplied to the face of each wafer is

such that the amount of inert gas supplied at the outer peripheral portion is larger than that at the center thereof." Appellants discussed the teachings of Bergman et al., arguing that Bergman's apparatus does not perform a method meeting this limitation.

In the final Office action of March 11, 2003, the Examiner addresses Appellants' arguments in the Response to Arguments section (paragraph no. 6 on page 4). The Examiner here argues that:

> "Bergman et al. discloses inputting the drying gas via a plurality of circumferentially spaced ports which are "oriented to direct the flow of drying gas" (emphasis added)" (emphasis in original).

The Examiner argues that:

> "the application of drying gas circumferentially around the edge of the wafer inward, without a drying gas outlet at the center, must inherently supply more drying gas to the outer edge of the wafer relative to the center of the wafer."

Appellants therefore submit that the issue in the present claims is whether this limitation of claim 1 is **inherent** when using the apparatus of Bergman et al. Appellants argue that this limitation is **not** inherent. In particular, Appellants note the following points:

(a) In Bergman's apparatus, the gas flows toward the center from the outside of the wafer and is **not directed to the face** of the wafer, as required by claim 1. This can be seen in Bergman's Figure 1 in the location of Bergman's drying gas introduction ports 76. Bergman et al., in column 9, lines 18-26, explicitly states that:

> "The drying gas can be input into the processing chamber via a plurality of circumferentially spaced ports which are at approximately the same elevation as the wafer or slightly below and oriented to **direct the flow of drying gas across the processed wafer surface.**" (Emphasis added)

The contrast between the method implicit in Bergman's apparatus and that of claim 1 may be seen by comparing Bergman's apparatus with the apparatus in Figure 2 of the present invention, in which the drying gas can be seen to be directed to the face of the wafer.

(b) The flow of gas in the Bergman is from the outside of the wafer toward the center. Appellants submit that the flow in Bergman et al.'s apparatus will not result in a greater supply at the periphery than at the center, since the gas entering through Bergman et al.'s ports 76 must apparently exit through central drain 50, although Bergman et al. does not appear to actually explain the gas flow in the apparatus.

With regard to claim group II (claim 2), Appellants also note the following point:

(a) Claim 2 recites that a sealed drying space is formed at the outer peripheral portion of the face of the wafer and the inert gas is supplied to the inside of the sealed drying space so that the space is filled with inert gas. Appellants submit that Bergman et al. does not disclose a sealed drying space at the outer peripheral portion of the face of the wafer. This may be seen by comparison of Bergman et al. with Figure 3 of the present application, in which sealed drying space A is illustrated. Appellants note that the Examiner has not indicated which particular part of Bergman et al.'s apparatus is a sealed drying space, referring only to "(see entire reference of Bergman et al., for instance, Figure 1, col. 8, lines 19-22)" (final Office action, bottom of page 2 to top of page 3). Bergman et al. does **not** appear to disclose such a sealed drying space in column 8, lines 19-22.

Appellants therefore submit that both claim groups I and II are not anticipated by Bergman et al. '708.

Issue B: Whether claims 1-3 are anticipated under 35 U.S.C. 102(b) by Cady (U.S. Patent No. 4,544,445), as stated in paragraph no. 4 of the final Office action.

In response to the Office action of November 20, 2003, in the Amendment dated February 10, 2003, Appellants argued that they could find no teaching in Cady that Cady's apparatus can achieve the limitation of claim 1 of the amount of inert gas being supplied at the outer portion being larger than at the center. Appellants discussed the gas flow that appeared to be inherent in Cady's apparatus.

In the Response to Arguments in paragraph no. 8 of the final Office action of March 11, 2003, the Examiner argues based on column 3, lines 38-49, and Figures 6-8B of Cady.

With regard to column 3, lines 38-49, the Examiner notes that Cady states that "a flow of nitrogen directed at the center of the wafer is needed to move the droplets." However, Appellants note that in order to achieve the limitation of claim 1 that "the amount of inert gas to be supplied to the face of each wafer is such that the amount of inert gas supplied at the outer peripheral portion is larger than that at the center thereof", it is **not sufficient** merely to direct the gas at the center of the wafer. As noted above, the present application discloses specific shapes of supply ports 32a in order to achieve this method limitation. Although the shapes of the supply ports themselves are not at issue in the present method claims, a review of Figures 4(A) to 4(C) of the present application makes it clear that particular steps must be taken to achieve this claim limitation.

The Examiner refers to Cady's Fig. 6-8B. Appellants submit that these arrangements of orifices do not clearly produce a gas flow meeting the limitation of claim 1.

Appellants note that Cady never teaches "the amount of inert gas to be supplied to the face of each wafer is such that the amount of inert gas supplied at the outer peripheral portion is larger than that at the center thereof" as a design goal. Rather, Cady discusses Figures 6-8B in the discussion of Figures 3-10 in column 9, lines 15-24. Cady discusses these with respect to "fluid flow". Although this can refer either to the washing liquid or drying gas, the reference to "centrifugal force along with the fluid surface tension" (column 9, lines 15-17) suggests that the delivery of washing liquid is the main consideration; the flow of drying gas is not discussed. Appellants submit that Cady's design is mainly directed to distributing liquid fluid flow toward the outer periphery to improve the uniformity of fluid flow on the face of the wafer.

With regard to the flow of drying gas, Appellants submit that Cady's Figures 6-8(B) do not show an apparatus having the function of supplying more gas toward the outer periphery than to the center. It is noteworthy that none of Cady's Figures 6-8(B) appears to resemble Figures 4(A) to 4(C) in the present application, which are designed to achieve this limitation.

Finally, Appellants here provide a Declaration under 37 CFR 1.132, signed by Hiroki Edo, regarding the teachings of Cady. In this Declaration, Mr. Edo analyzes the gas flow to be expected in Cady's apparatus. Mr. Edo concludes that Cady's figures cannot be interpreted as showing that more gas is supplied toward the peripheral portion of the wafer surface than at the center, and that Cady's apparatus cannot inherently meet the limitations of claim 1. Consideration of Mr. Edo's technical analysis along with the preceding points is respectfully requested.

Appellants therefore submit that claim group I (claims 1-2) is not anticipated by Cady '445.

With regard to claim group II (claim 2), in addition to the above arguments regarding claim 1, Appellants also note the following point:

(a) Claim 2 recites that a sealed drying space is formed at the outer peripheral portion of the face of the wafer and the inert gas is supplied to the inside of the sealed drying space so that the space is filled with inert gas. Appellants submit that Cady does not disclose a sealed drying space at the outer peripheral portion of the face of the wafer. This may be seen by comparison of Cady with Figure 3 of the present application, in which sealed drying space A is illustrated. The Examiner has cited Cady's arrows 40 as illustrating the sealed drying space. However, arrows 40 illustrate the **fluid flow** (see column 7, line 46), not a sealed space.

Appellants therefore submit that claim group II (claim 2) is also not anticipated by Cady '445.

In the event this paper is not timely filed, appellant hereby petitions for an appropriate extension of time. The fee for any such extension may be charged to our Deposit Account No. 01-2340, along with any other additional fees which may be required with respect to this paper.

Respectfully submitted,

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Enclosures: Appendix
Declaration under 37 CFR 1.132 by Hiroki Edo

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IX. APPENDIX A-CLAIMS INVOLVED IN THE APPEAL

Claims 1-3 are involved in the appeal.

1. A single wafer type substrate cleaning method of wet-cleaned wafers which are not stored in a cassette, individually, in a sealed cleaning housing, said method consisting of the application of a spin drying treatment to the face of each wafer by supporting and rotating each wafer at high speed in the sealed cleaning housing while an inert gas for preventing oxidation is supplied to the face of the wafer in a drying step, where the amount of inert gas to be supplied to the face of each wafer is such that the amount of inert gas supplied at the outer peripheral portion is larger than that at the center thereof.

2. The single wafer type substrate cleaning method according to Claim 1, wherein a sealed drying space is formed at the outer peripheral portion of the face of the wafer and the inert gas is supplied to the inside of the sealed drying space so that the space is filled with inert gas.

3. The single wafer type substrate cleaning method according to Claim 1, wherein the inert gas employed is a nitrogen gas.